REPORT OF GEOTECHNICAL EXPLORATION

VA HOSPICE CARE UNIT
DUBLIN, GEORGIA

FOR

J M SMITH ENGINEERING, LLC

JANUARY 6, 2010

ECS PROJECT NO. 10:5658

ECS SOUTHEAST, LLC

Geotechnical • Construction Materials • Environmental

January 6, 2010

Mr. Jason Smith, P.E.
J M Smith Engineering, LLC
PO Box 331
Cornelia, GA 30531

Reference: Report of Geotechnical Exploration
VA Hospice Care Unit
1826 Veterans Blvd.
Dublin, Georgia

ECS Project No. 10:5658

Dear Mr. Smith:

ECS Southeast, LLC (ECS) is pleased to submit our report of geotechnical exploration for the above referenced project. The attached report presents an introduction of the proposed project, results of our exploration, subsurface conditions, and our recommendations. The work was completed in general accordance with ECS Proposal No. PAG-6550 as authorized by Mr. Jason Smith, P.E. with J M Smith Engineering, LLC on November 30, 2009.

We appreciate the opportunity of working with you on this project and look forward to our continued association. Should you have questions regarding our findings or need additional consultations, please do not hesitate to contact our office at (770) 590-1971.

Respectfully,

ECS SOUTHEAST, LLC represented by:

GEORGIA REGISTERED No. 27394 PROFESSIONAL ENGINEER JOHN C. HARPRING

Jay Hornsby, P.G.
Senior Project Geologist

John Harpring, P.E.
Vice President / Branch Manager
GA Registration No. 27394

REPORT OF GEOTECHNICAL EXPLORATION

VA HOSPICE CARE UNIT
DUBLIN, GEORGIA

TABLE OF CONTENTS

INTRODUCTION

General

This report presents the results of a geotechnical exploration for the proposed VA Hospice Care Unit in Dublin, Georgia. Work was performed in general accordance ECS Proposal No. PAG-6550 as authorized by Mr. Jason Smith, P.E. with J M Smith Engineering, LLC on November 30, 2009.

Project Information

The information presented in this section is based on information provided and our site reconnaissance. The site is located at 1826 Veterans Boulevard in Dublin, Georgia. A Site Vicinity Map is included in the Appendix as Figure 1.

We understand the project consists of the construction of a 1-story building with a plan area of approximately 15,000 square feet. At the time of this project, no structural loading information was available. We assume the maximum column loads will not exceed 100 kips and the maximum strip loads will not exceed 3 kips per linear foot. We understand that an underground steam tunnel may be installed onsite. At the time of this report, no plans or information on this tunnel was available.

The surface elevations range from approximately 242 to 246 feet across the site. From the grading plan provided, we understand the proposed finished floor elevation (FFE) will be at approximately 246 feet. This may require up to approximately 4 feet of fill in the development area.

At the time of fieldwork, the project area was developed with the VA Hospital and associated buildings, parking lots, and driveways. The area of the proposed construction was grassy and developed as a baseball field.

The attached Boring Location Plan (Figure 2) presents the site development concept at the time of this report. If any of the information presented is incorrect or has changed, please advise ECS so that we may reevaluate our recommendations in the light of changes in the present project concept.

Purposes of Exploration

The purposes of this exploration were to explore the soil and groundwater conditions at the site and to develop engineering recommendations to guide design and construction of the proposed project.

We accomplished the purposes of the study by:

1. Reviewing the available publications concerning local geology of the site and performing a general site reconnaissance.

2. Drilling borings/soundings to explore the subsurface soil and groundwater conditions.

3. Performing laboratory tests on selected representative soil samples from the borings to evaluate pertinent engineering properties.

4. Evaluating the field and laboratory data to develop appropriate engineering recommendations.

FIELD EXPLORATION AND LABORATORY TESTING

Subsurface Exploration

To explore the soil and groundwater conditions at this site a total of five (5) Cone Penetration Test (CPT) soundings and one (1) continuous soil samples (Geoprobe) were performed. The CPT soundings were performed to refusal/termination depths of 15 to 53.5 feet below existing grade in the proposed building area. A Geoprobe was performed to a depth of 15 feet below existing grade adjacent to a CPT sounding (B-3). Hand auger borings were performed to a depth of 5 feet below existing grade adjacent to CMT soundings (B-1, B-2, B-4, and B-5). The approximate boring/sounding locations are shown on the attached Boring Location Plan (Figure 2).

In the CPT sounding procedure (ASTM D5778), an electronically instrumented cone penetrometer is hydraulically advanced through the soil to measure point resistance, pore water pressure, and sleeve friction. These values are recorded continuously as the cone is pushed to the desired depth. Stratification lines on the CPT sounding logs represent approximate boundaries between soil behavior types. Soil behavior types are calculated based on empirical relationships between cone penetrometer tip resistance, sleeve friction, and pore water pressure. Groundwater levels in the CPT soundings were recorded during hydraulic advancement of the cone penetrometer.

In the Geoprobe procedure, an acetate tube inside a thin-walled tube sampler is advanced through the soil to collect continuous five-foot section samples of the subsurface material. The acetate tubes are removed from the thin-wall sampler and logged. Representative samples are sealed and returned to our laboratory in Marietta, Georgia.

Representative soil samples for hand auger borings were obtained by means of the hand operated auger sampling procedure in general accordance with ASTM Specification D-1452. In this procedure, the auger boring was made by rotating and advancing the auger bucket to the desired depths while periodically removing the bucket from the hole to clear and examine the auger cuttings.

Sounding and boring locations were determined in the field by our representative who measured distances and estimated right angles from existing site features. As these methods are not precise, the boring locations shown on the attached Boring Location Plan (Figure 2) should be considered approximate.

Laboratory Testing Program

Representative soil samples were selected and tested in our laboratory to check visual classifications and to determine pertinent engineering properties. The laboratory testing program included visual classifications of all soil samples as well as gradation analysis, Atterberg limits, and natural moisture content testing on selected soil samples.

An experienced geotechnical engineer classified each soil sample on the basis of texture and plasticity in accordance with the Unified Soil Classification System. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. The geotechnical engineer grouped the various soil types into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs and profiles are approximate; in-situ, the transitions may be gradual.

The soil samples will be retained in our laboratory for a period of 60 days, after which, they will be discarded unless other instructions are received as to their disposition.

REGIONAL GEOLOGY AND SUBSURFACE CONDITIONS

Regional Geology

The site is located within Georgia's Coastal Plain Geologic Province. According to the Geologic Map of Georiga (1976), the site is in the Neogene Undifferentiated Formation. The soils of the Southern Coastal Plain Physiographic Province of Georgia are primarily composed of Pleistocene to Holocene age deposits. The soil in the coastal plain is the result of sediment deposition in a former marine environment, during a time when sea levels were much higher than they are at present. The Pleistocene-Holocene deposits are generally composed of alternating sands, silts, and clays, which correspond to fluctuations in sea-level and river migrations over several million years.

The shallow groundwater table in the coastal region can fluctuate several feet with seasonal rainfall. Seasonal high groundwater levels are typically found at shallow depths in the flood plains with a reasonable probability of flooding in winter and spring. Seasonal high groundwater can be found at the surface in poorly draining areas. The groundwater table can exhibit some distortions due to differences in vertical and lateral permeability.

Based on the online Soil Survey of Johnson and Laurens Counties, Georgia, as prepared by the US Department of Agriculture Soil Conservation Service, a summary of the predominant soil types (within the upper 5 feet below existing grade) at the site and their characteristics is included in the following table:

Soil Type	Constituents	Internal Drainage	Seasonal High Water Table (inches)
FaB - Faceville sandy loam	Sands, Clays	Well drained	80+
TfB - Tifton loamy sand	Sands, Clays	Well drained	42 to 72

Soil Conditions

Data from the subsurface exploration is included in the Appendix. The subsurface conditions discussed in the following paragraphs and those shown on the sounding and boring logs represent an estimate of the subsurface conditions based on interpretation of the data using normally accepted geotechnical engineering judgments. We note that the transition between soil strata is usually less distinct than those shown on the sounding, Geoprobe, and hand auger logs.

Topsoil is a dark-colored surficial material with a high organic content and is generally unsuitable for structural support. Up to two and a half (2.5) inches of topsoil was observed in the Geoprobe and hand augers performed. Some variation should be expected during site preparation.

The CPT soundings and Geoprobe/hand augers conducted for this exploration recorded similar soil behavior types across the site. From the samples recovered in the geoprobes, the soils were described as natural soils. The soundings generally recorded layers of silty Sand (SM), clayey Sand (SC), Silt (ML), and Clay (CL) soil behavior types to sounding refusal/termination depths. CPT-3 refused at a depth of 53.5 feet below existing grade. Standard Penetration resistances (N-values) generated from the cone soundings (N_{60}) ranged from approximately 5 to 50+ blows per foot (bpf).

Groundwater Conditions

Groundwater levels were measured at the time of fieldwork. Groundwater was observed at the time of drilling at a depth of 16.5 feet below existing grade in B-3. Please note that groundwater levels in coastal geology fluctuate with tidal, seasonal, and climatic variations, and may be significantly different at other times. The groundwater levels should be checked prior to construction to assess its effects on grading operations and other activities.

ANALYSIS AND RECOMMENDATIONS

Foundation Design and Settlement

Assuming any unsuitable materials or low consistency soils found at shallow depth are over-excavated if found during construction, footings may be constructed on engineered soil fills or on natural soils constructed in accordance with the requirements outlined herein. A net allowable bearing pressure of 2,000 psf is recommended.

In order to reduce the possibility of foundation bearing failure and excessive settlement due to local shear or "punching" action, we recommend that continuous footings have a minimum width of 1.5 feet and that isolated column footings have a minimum lateral dimension of 3 feet. In addition, footings should be placed at a depth to provide adequate bearing capacity. For this site, we recommend footing bottoms be placed at a minimum depth of 1.5 feet below finished grade.

Settlement of individual footings, designed in accordance with recommendations presented in this report, is expected to be within tolerable limits. For footings placed on engineered fill or residual soils constructed in accordance with the requirements outlined in this report, maximum total settlement is expected to be less than 1 inch. Maximum differential settlement between adjacent columns or load bearing walls is expected to be half the total settlement.

The above settlement values are based on our engineering experience with similar soil conditions and the anticipated structural loading, and are to guide the structural engineer with his design. To minimize difficulties during the foundation installation phase, it is critical that ECS be retained to observe the foundation bearing surfaces and to confirm the recommended bearing pressures and lack of unsuitable material during construction.

Ground Floor Slab Design

We recommend that the floor slab be isolated from the foundation footings so differential settlement of the structure will not induce shear stresses on the floor slab. Also, to minimize the crack width of any shrinkage cracks that may develop near the surface of the slab, we recommend mesh reinforcement be included in the design of the floor slab. The mesh should be in the top half of the slab to be effective.

We also recommend the slabs-on-grade be underlain by a minimum of 4 inches of granular material having a maximum aggregate size of 1.5 inches and no more than 2% of fines. This granular layer will facilitate the fine grading of the subgrade and help prevent the rise of water through the floor slab. Prior to placing the granular material, the floor subgrade soil should be properly compacted, proofrolled, and free of standing water, mud, and frozen soil. Before the placement of concrete, a vapor barrier may be placed on top of the granular material to provide additional moisture protection. However, special attention should be given to the surface curing of the slab in order to minimize uneven drying of the slab and associated cracking.

Underground Steam Tunnels

During installation, the bottom of the steam tunnel excavation should be stable and dry at the time of placement. Because of the high groundwater conditions in areas of the site, it may be necessary to perform remedial dewatering and/or gravel placement prior to steam tunnel installation. Please refer to the Dewatering section below.

We recommend the steam tunnel designer review the groundwater readings and design for possible buoyancy/uplift conditions. Traditionally, an anchorage mat or tie down anchors is installed to restrain the steam tunnel from heaving upward during high groundwater/ empty conditions. The following soil parameters can be used in your analysis:

- Moist Unit Weight of Soil - 110 pcf
- Angle of Internal Friction (ϕ) - 28 degrees

Pavement Design

Based on information provided, a typical minimum pavement section is shown below. We understand the following:

1. California Bearing Ratio (CBR) samples were not obtained for the proposed subgrade soils at these sites. Our pavement design analyses are based on assumed CBR values.

2. Our pavement design analysis is based on assumed traffic information.

3. We assume that the top 12 inches of the proposed roadway subgrade will be compacted to at least 98% of maximum dry density in accordance ASTM Specification D1557, Modified Proctor Method.

4. We assume that criteria from our sections entitled “Subgrade Preparation” and “Fill Placement” will be followed.

5. We assume a minimum separation of 24 inches between the base course material and the high groundwater table. Underdrains may be used to provide this separation.

Typical Flexible Pavement Section

Material Type	Parking Stalls and Driveways	Heavy Duty Truck Driveways
AC Surface Course HMA Superpave – 9.5mm	2.0 inches	1.0 inch
AC Base Course HMA Superpave – 12.5mm	-	2.0 inches
Graded Aggregate Base (GAB)	6.0 inches	8.0 inches

All aggregate material used as base course must comply with the gradation requirements established by the GDOT. Aggregate material should be compacted to at least 98% of the maximum dry density obtained in accordance with ASTM D-698, Standard Proctor Method.

The flexible pavement specifications used in roadways and parking stalls may not be adequate for a trash compactor/dumpster pick-up area due to the heavy loads anticipated. We recommend that a rigid concrete pavement section be provided for those areas. The concrete section should be at least 6 inches thick and should consist of concrete having a minimum 28-day compressive strength of 4,000 pounds per square inch (psi). A minimum of 4 inches of compacted graded aggregate base should be placed beneath all rigid concrete pavements. For dumpster storage areas, the concrete slab area should be large enough to support both the dumpster and the truck used to unload the dumpster.

An important consideration with the design and construction of pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the base course layer, softening of the subgrade and other problems related to the deterioration of the pavement can be expected. Furthermore, good drainage should minimize the risk of the subgrade materials becoming saturated over a long period of time.

Seismic Site Class

From site-specific test boring data, the Site Class was determined from Table 1613.5.2 of the IBC 2006. The site-specific data used to determine the Site Class typically includes borings drilled to refusal materials to determine Standard Penetration resistances (N-values). Based on actual and/or estimated average N-values in the upper 100 feet of the soil/rock profile, we estimated an N_{bar} value that corresponds to a Site Class D ($15 \leq N_{bar} \leq 50$).

Based on the information obtained from the borings and soundings, it is our opinion that the potential for liquefaction of the native soils at the site due to earthquake activity is relatively low.

CONSTRUCTION RECOMMENDATIONS

Subgrade Preparation

The subgrade preparation should consist of stripping all vegetation, rootmat, topsoil, and any other soft or unsuitable material from the building and pavement areas. We recommend earthwork clearing be extended a minimum of 10 feet beyond the building and 5 feet beyond pavement limits. Stripping limits should be extended an additional 1 foot for each foot of fill required at the building areas exterior edge. This would include the removal of any abandoned utilities or existing structure foundations.

Depending on planned finished grades, any unsuitable existing material should be “demucked” or over-excavated as to allow for a minimum 2 foot “cushion” of suitable material in the building and pavement areas. The “cushion” is understood to extend from below the building slab granular base material (if needed), or below roadway graded aggregate base material. Unsuitable soil materials are defined as those complying with ASTM D2487 soil classification groups ML, MH, CH, CL, OL, OH and PT. Additionally, soil materials defined as those complying with ASTM D2487 soil classification groups SC or SM may be deemed unusable during subgrade evaluation due to the natural moisture content, consistency, or fines content of the material. The unsuitable or unusable material should be replaced with approved structural fill as defined in the following section “Fill Placment”.

After stripping, “demucking”, or over-excavating to the desired grade, and prior to fill placement, the exposed surface should be observed by an experienced geotechnical engineer or his authorized representative. For building and pavement areas, the subgrade should be densified with a large vibratory roller to achieve a uniform subgrade. In areas with minimal fill planned (less than 2 feet), the existing subgrade should consist of suitable soils such as those defined by ASTM D2487 soil classification groups GW, GP, GM, SC, SM, SW, SP-SC, and SP.

After the completion of densification, proofrolling using a loaded dump truck having an axle weight of at least 10 tons should be used to aid in identifying localized soft or unsuitable material. Any soft or unsuitable materials encountered during this proofrolling should be removed and replaced with an approved backfill compacted to the criteria given below. ECS can provide alternative options such as using geogrid and/or geotextile to stabilize the subgrade at the time of construction, if necessary.

Any below ground construction/utilities in the vicinity of the proposed building should be removed prior to the initiation of new construction. We suggest that all available information regarding the existing utilities at the site be reviewed prior to construction.

Fill Placement

The preparation of fill subgrades as well as proposed building or roadway subgrades should be observed on a full-time basis by a representative of ECS to confirm that any unsuitable materials have been removed and that the subgrade is suitable for support of the proposed construction and/or fills.

Fill in structural areas should be placed over a stable subgrade. Soils used for structural fill shall have a PI (Plasticity Index) of less than 10, and a LL (Liquid Limit) of less than 30. The soils to be used as structural fill in the building pad areas and below the top 2 feet in pavement areas should be inorganic, non-plastic granular soil containing less than 25 percent fines passing the No. 200 sieve. The soils to be used as structural fill within the top 2 feet below pavement areas should be inorganic, non-plastic granular soil containing less than 15 percent fines passing the No. 200 sieve. The structural fill depths are understood to extend from below the building slab granular base material (if needed) or roadway graded aggregate base material.

In general, the existing natural soils appear generally suitable for re-use as structural fill if they are free from deleterious materials, such as organics and debris. Depending on the rainfall conditions at the time of construction, the clayey natural soils at the site could become unworkable.

The structural fill should be placed in level lifts not exceeding 12 inches in loose thickness and compacted to at least 95% of the maximum dry density obtained in accordance with ASTM Specification D1557, Modified Proctor Method. Fill placed within the top 12 inches in pavement areas should be compacted to at least 98% of the maximum dry density obtained in accordance with ASTM Specification D1557, Modified Proctor Method. In-place density tests shall be performed by an experienced engineering technician working under the direction of a licensed geotechnical engineer with a minimum of 1 test per 2,500 square feet of fill area for each lift of fill placed. The elevation and location of the tests should be clearly identified and recorded at the time of fill placement.

The moisture content of the fill at the time of placement shall be within +/- 3% (wet or dry) of the optimum moisture content, as determined by the appropriate proctor compaction tests. Moisture contents may be controlled by disking or other approved chemical or mechanical means to achieve the desired moisture content and density specification.

Dewatering

Because of the groundwater conditions in areas of the site, it may be necessary to perform remedial dewatering prior to earthwork operations including utility installation. The remedial dewatering operations may consist of installing a well point system, perimeter rim ditches and if necessary secondary rim-ditches to withdraw groundwater. Temporary dewatering will not only help lower the natural moisture content of the subgrade soils but will also allow heavy construction equipment to gain access to portions of the site. The groundwater table should be controlled at least 3 feet below the compacted or excavated surfaces.

Additional Considerations

Exposure to the environment may weaken the soils at the footing bearing level if the foundation excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that excavations are dug. If surface water intrusion or exposure softens the bearing soils, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. If the excavation must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, we recommend that the foundations be covered or otherwise protected.

Positive site drainage should be maintained during earthwork operations, which should help maintain the integrity of the soil. Placement of fill on the near surface soils, which have become saturated, could be very difficult. When wet, these soils will degrade quickly with disturbance from contractor operations and will be extremely difficult to stabilize for fill placement.

The surface of the site should be kept properly graded in order to enhance drainage of the surface water away from the proposed structure areas during the construction phase. We recommend that an attempt be made to enhance the natural drainage without interrupting its pattern.

The surficial soils contain fines, which are considered moderately erodible. All erosion and sedimentation shall be controlled in accordance with Best Management Practices and current County and State NPDES requirements. At the appropriate time, we would be pleased to provide a proposal for conducting construction materials testing and NPDES services.

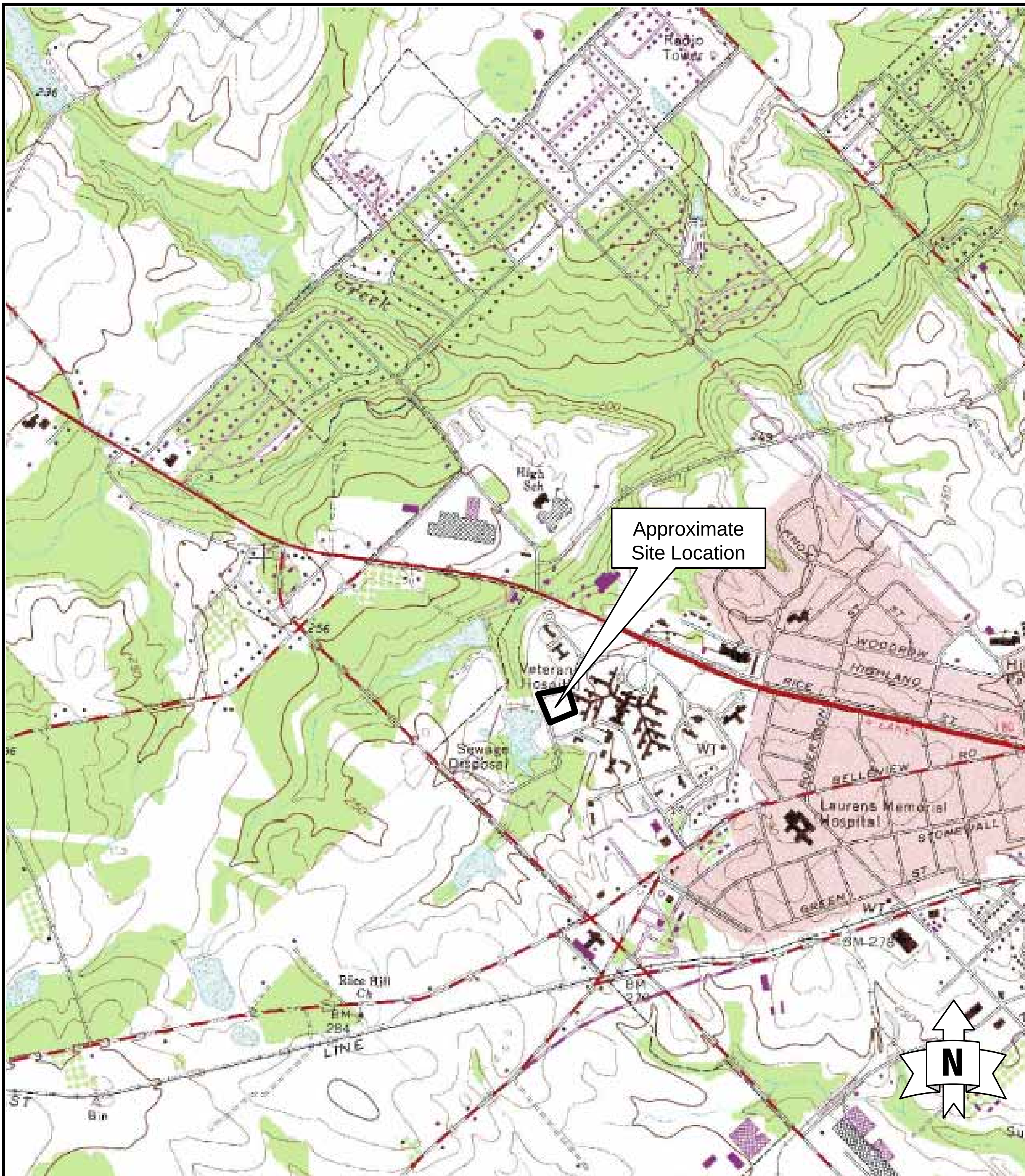
CLOSING

This report has been prepared in accordance with generally accepted geotechnical engineering practice. No warranty is expressed or implied. The evaluations and recommendations presented in this report are based on the available project information, as well as on the results of the exploration. ECS should be given the opportunity to review the final drawings and site plans for this project to determine if changes to the recommendations outlined in this report are needed.

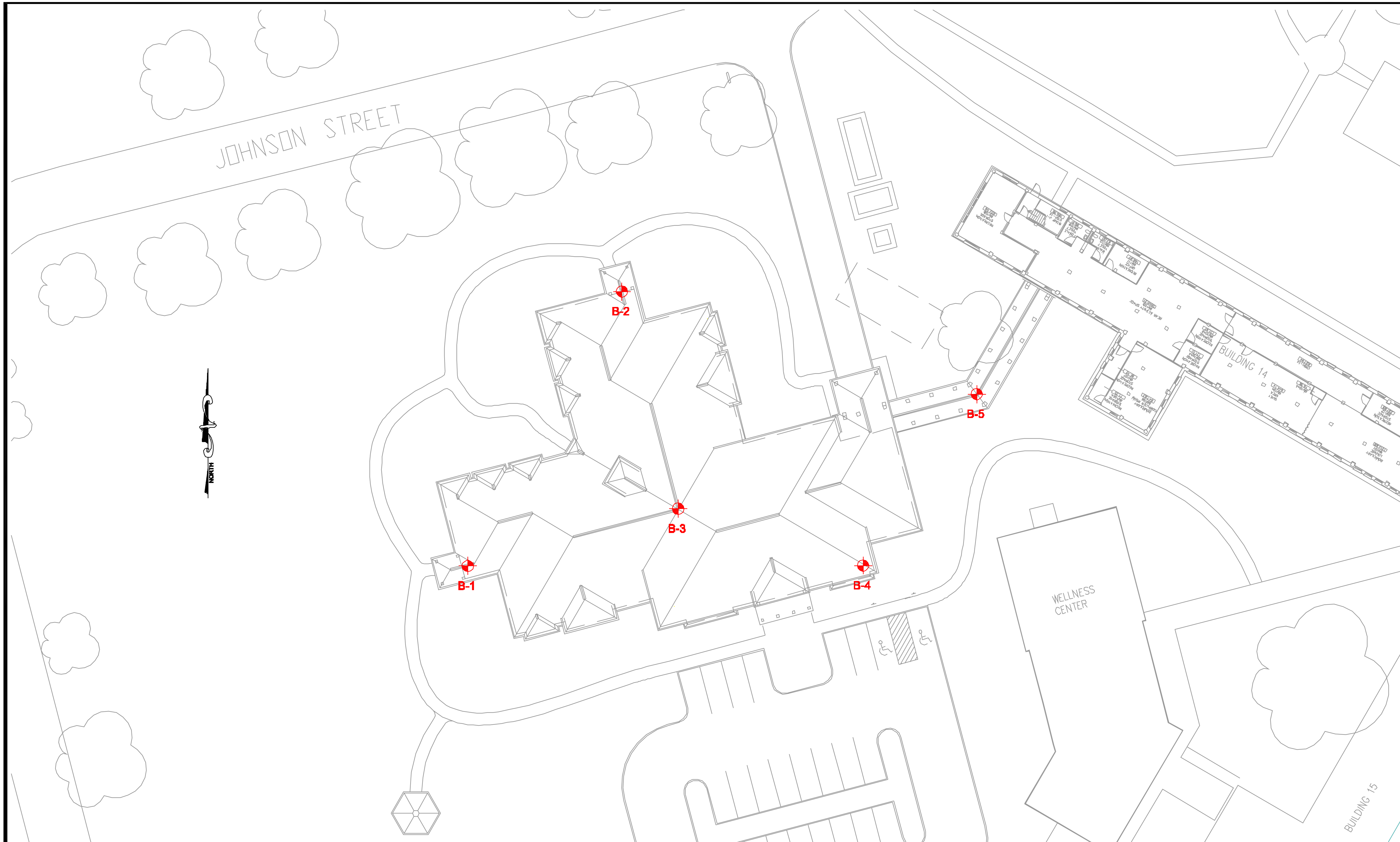
This report is provided for the exclusive use of J M Smith Engineering, LLC and their project specific design team. This report is not intended to be used or relied upon in connection with other projects or by other third parties. ECS disclaims liability for any third party use or reliance without express written permission.

We recommend that the construction activities be monitored by ECS to provide the necessary overview and to check the suitability of the subgrade soils for supporting the footings. We would be pleased to provide an estimated cost for these services at the appropriate time.

Appendix I



SITE VICINITY MAP		**Figure No.:**
REPORT OF GEOTECHNICAL EXPLORATION	**Project No.: 10:5658**	**1**
VA Hospice Care Unit	**Not to Scale**	
Reference: USGS Quadrangle: Dublin, Georgia dated 1985	**Date: 1/10**	



LEGEND

- Approximate Boring Location
- B-X Boring Designation

Graphic Scale 1"=40'

40 20 0 10 20 30 40

ECS LLC
SOUTHEAST

PROJECT: VA Hospice Care Unit
Dublin, GA

PREPARED FOR: J M Smith Engineering, LLC

FIGURE NAME: Boring Location Plan

REFERENCE: J M Smith Engineering, LLC

REVISIONS

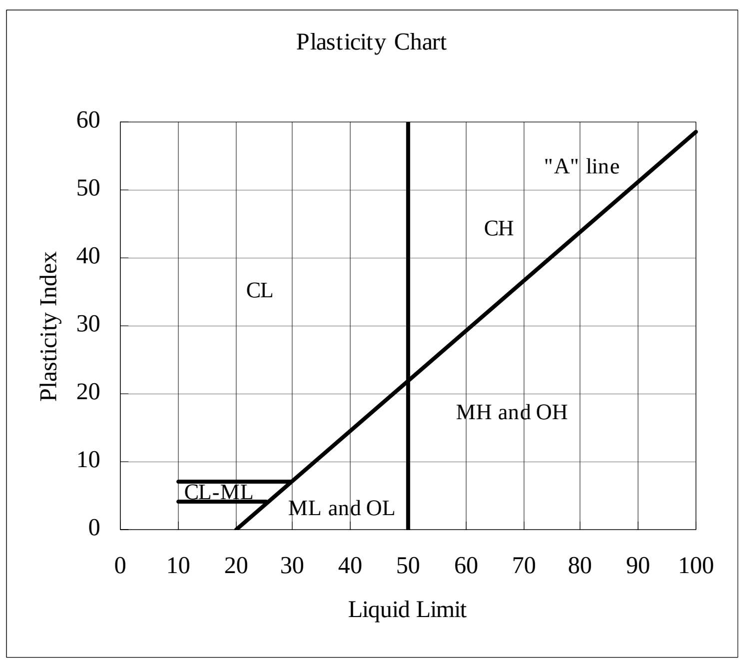
JOB NO.	10:5658	
SCALE	1"=40'	
DRAWN	CDR	12/09
APPR.	JCH	12/09

Figure No.: 2

Appendix II

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

Major Divisions			Group Symbols		Typical Names	Laboratory Classification Criteria		
Coarse-grained soils (More than half of material is larger than No. 200 Sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 percent GW, GP, SW, SP; More than 12 percent GM, GC, SM, SC; 5 to 12 percent Borderline cases requiring dual symbols [b]	$C_u = D_{60}/D_{10}$ greater than 4 $C_c = (D_{30})^2/(D_{10}xD_{60})$ between 1 and 3	
			GP		Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM[a]	d	Silty gravels, gravel-sand mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
				u				
			GC		Clayey gravels, gravel-sand-clay mixtures		Atterberg limits below "A" line or P.I. less than 7	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines		$C_u = D_{60}/D_{10}$ greater than 6 $C_c = (D_{30})^2/(D_{10}xD_{60})$ between 1 and 3	
			SP		Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM[a]	d	Silty sands, sand-silt mixtures		Atterberg limits above "A" line or P.I. less than 4	Limits plotting in CL-ML zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
				u				
			SC		Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils (More than half material is smaller than No. 200 Sieve)	Silts and clays (Liquid limit less than 50)		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity	Plasticity Chart (see below)		
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL		Organic silts and organic silty clays of low plasticity			
	Silts and clays (Liquid limit greater than 50)		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH		Inorganic clays of high plasticity, fat clays			
			OH		Organic clays of medium to high plasticity, organic silts			
	Highly Organic soils		Pt		Peat and other highly organic soils			



[a] Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits; suffix d used when L.L. is 28 or less and the P.I. is 6 or less; the suffix u used when L.L. is greater than 28.

[b] Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC,well-graded gravel-sand mixture with clay binder. (From Table 2.16 - Winterkorn and Fang, 1975)

REFERENCE NOTES FOR BORING LOGS

I. Drilling Sampling Symbols

SS	Split Spoon Sampler	ST	Shelby Tube Sampler
RC	Rock Core, NX, BX, AX	PM	Pressuremeter
DC	Dutch Cone Penetrometer	RD	Rock Bit Drilling
BS	Bulk Sample of Cuttings	PA	Power Auger (no sample)
HSA	Hollow Stem Auger	WS	Wash sample
REC	Rock Sample Recovery %	RQD	Rock Quality Designation %

II. Correlation of Penetration Resistances to Soil Properties

Standard Penetration (blows/ft) refers to the blows per foot of a 140 lb. hammer falling 30 inches on a 2-inch OD split-spoon sampler, as specified in ASTM D 1586. The blow count is commonly referred to as the N-value.

A. Non-Cohesive Soils (Silt, Sand, Gravel and Combinations)

Density		*Relative Properties*	
Under 4 blows/ft	Very Loose	Adjective Form	12% to 49%
5 to 10 blows/ft	Loose	With	5% to 12%
11 to 30 blows/ft	Medium Dense		
31 to 50 blows/ft	Dense		
Over 51 blows/ft	Very Dense		

Particle Size Identification		
Boulders		8 inches or larger
Cobbles		3 to 8 inches
Gravel	Coarse	1 to 3 inches
	Medium	½ to 1 inch
	Fine	¼ to ½ inch
Sand	Coarse	2.00 mm to ¼ inch (dia. of lead pencil)
	Medium	0.42 to 2.00 mm (dia. of broom straw)
	Fine	0.074 to 0.42 mm (dia. of human hair)
Silt and Clay		0.0 to 0.074 mm (particles cannot be seen)

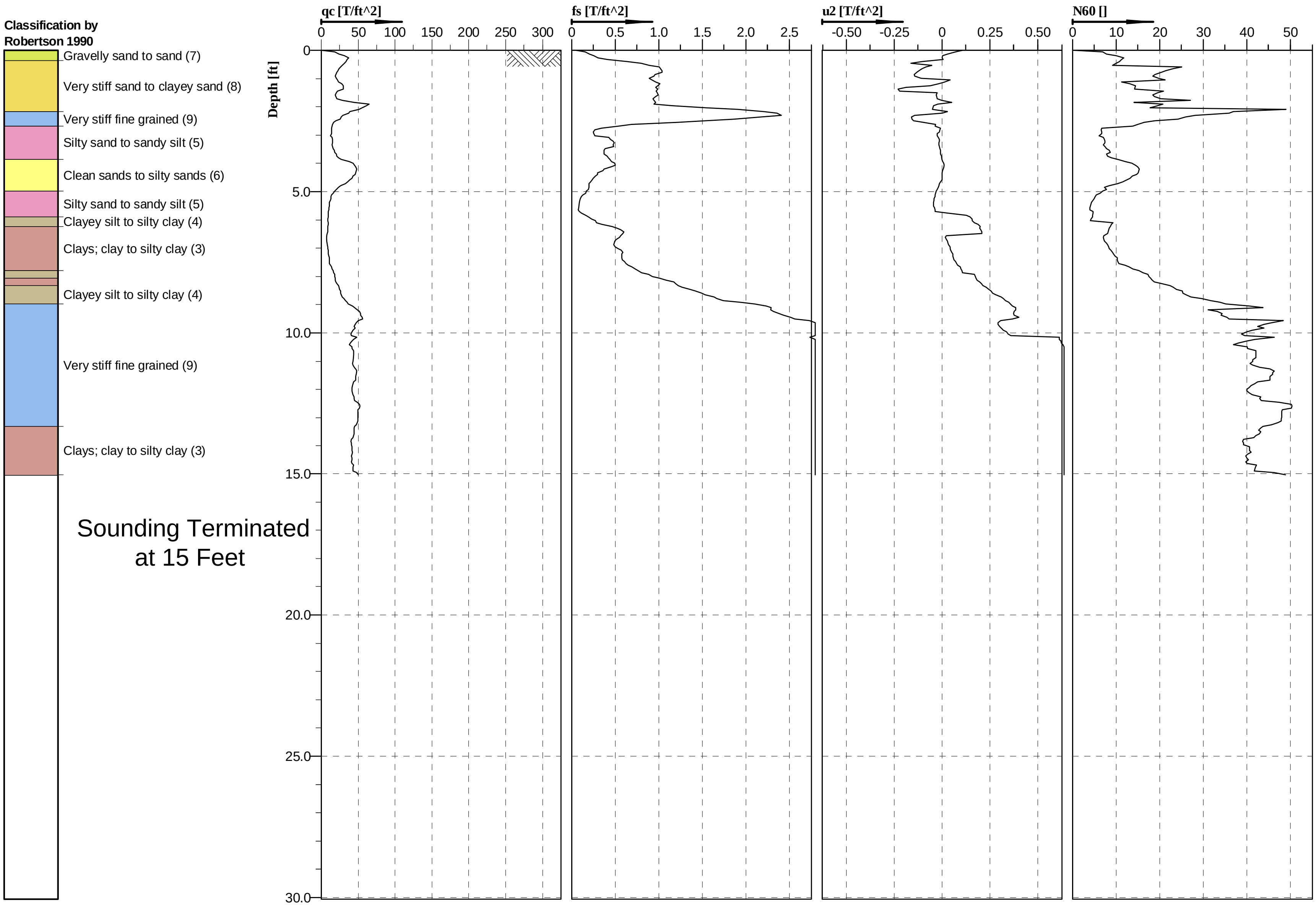
B. Cohesive Soils (Clay, Silt, and Combinations)

Blows/ft	*Consistency*	*Unconfined Comp. Strength Q_p (tsf)*	*Degree of Plasticity*	*Plasticity Index*
Under 2	Very Soft	Under 0.25	None to slight	0 – 4
3 to 4	Soft	0.25-0.49	Slight	5 – 7
5 to 8	Medium Stiff	0.50-0.99	Medium	8 – 22
9 to 15	Stiff	1.00-1.99	High to Very High	Over 22
16 to 30	Very Stiff	2.00-3.00		
31 to 50	Hard	4.00–8.00		
Over 51	Very Hard	Over 8.00		

III. Water Level Measurement Symbols

WL	Water Level	BCR	Before Casing Removal	DCI	Dry Cave-In
WS	While Sampling	ACR	After Casing Removal	WCI	Wet Cave-In
WD	While Drilling	▽	Est. Groundwater Level	▼	Est. Seasonal High GWT

The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in a granular soil. In clay and plastic silts, the accurate determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally applied.

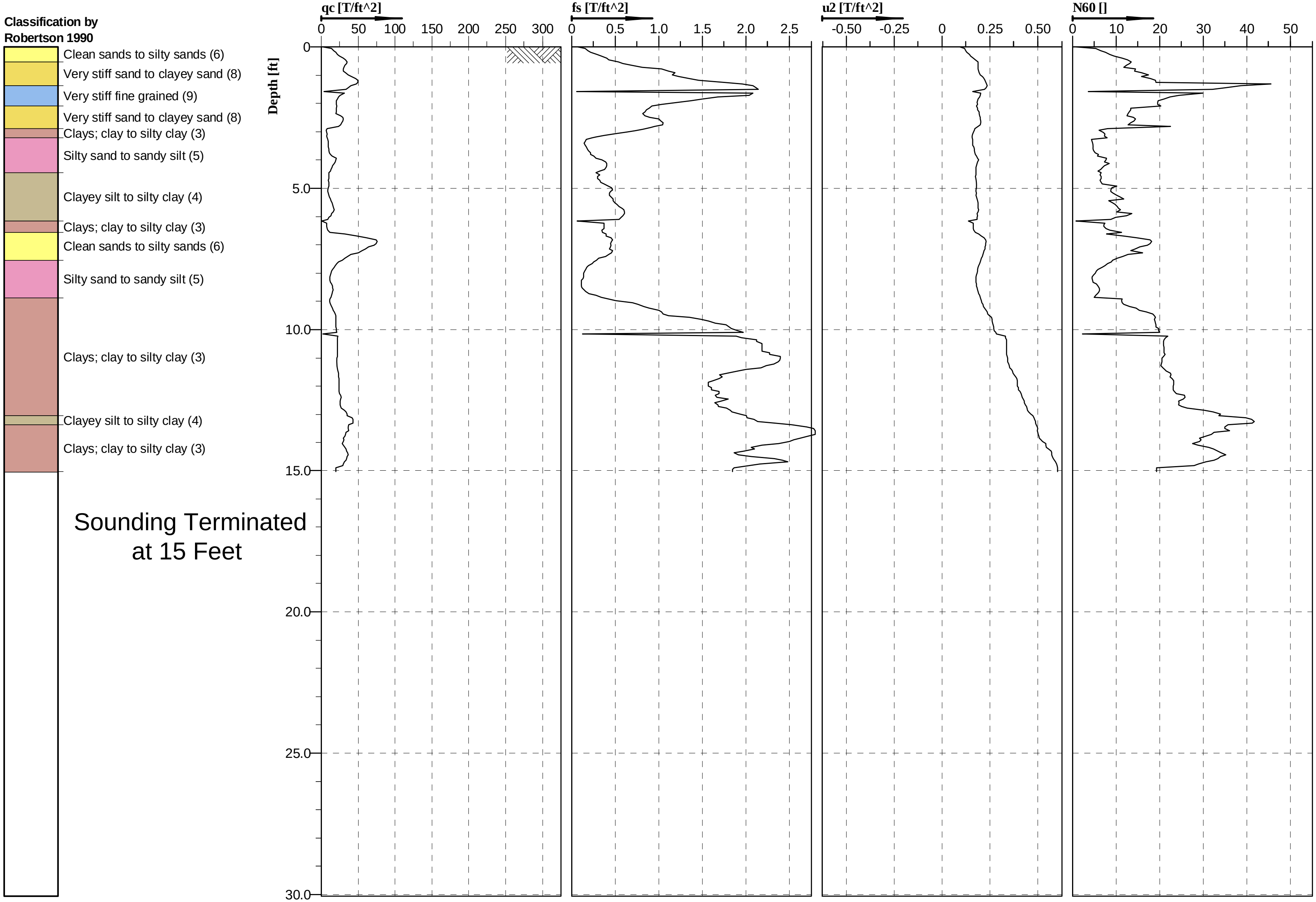


ECS LLC SOUTHEAST

U2

Cone No: 3814 NO ME
Tip area [cm2]: 10
Sleeve area [cm2]: 150

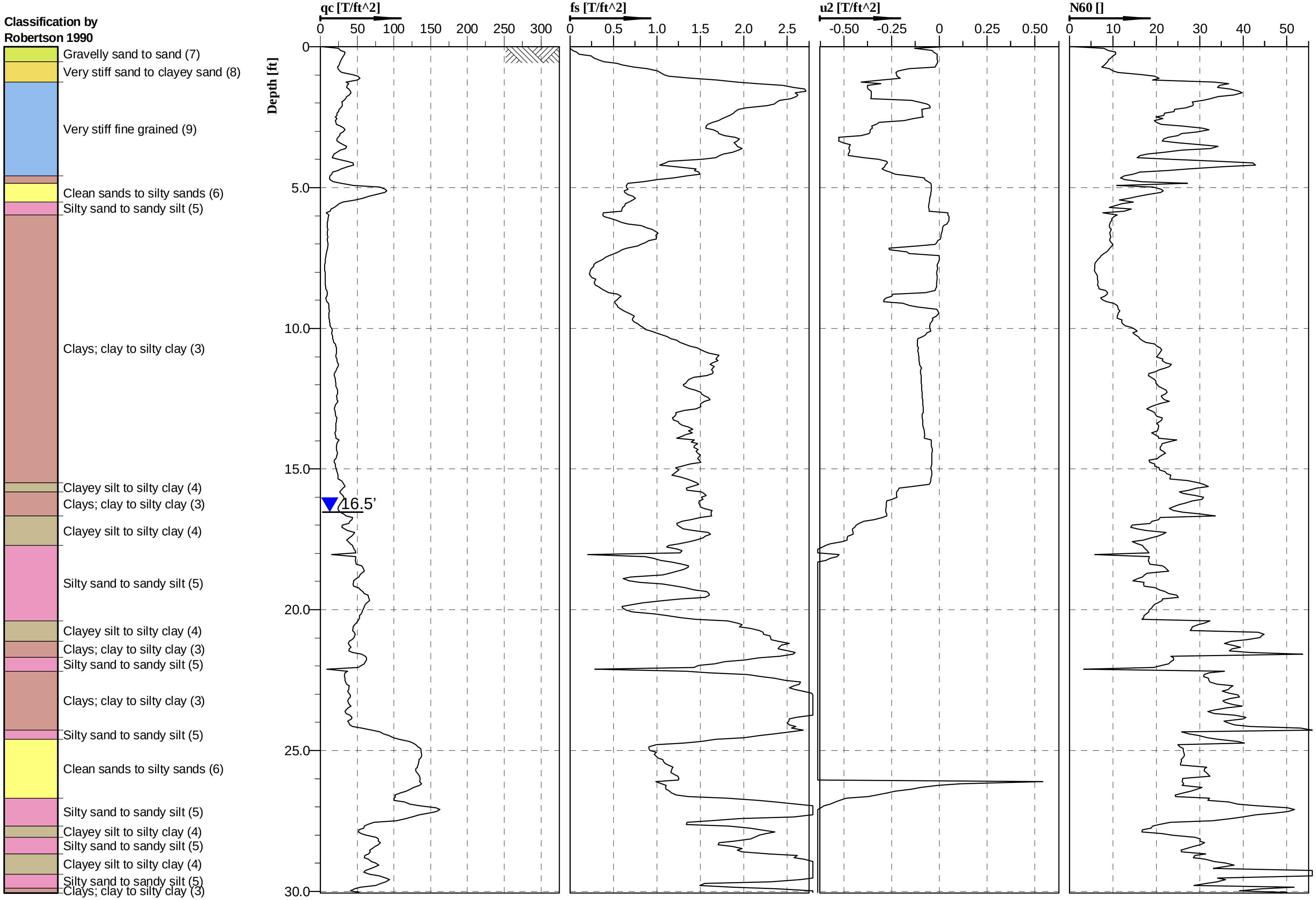
Location: Dublin, Georgia	Project ID: 10:5658	Ground Elev.:	Test No.: B-1
Project: VA Hospice Care Unit	Client: J M Smith Engineering, LLC	Date: 12/28/09	Page.: 1/1



U2

Cone No: 3814 NO ME
Tip area [cm2]: 10
Sleeve area [cm2]: 150

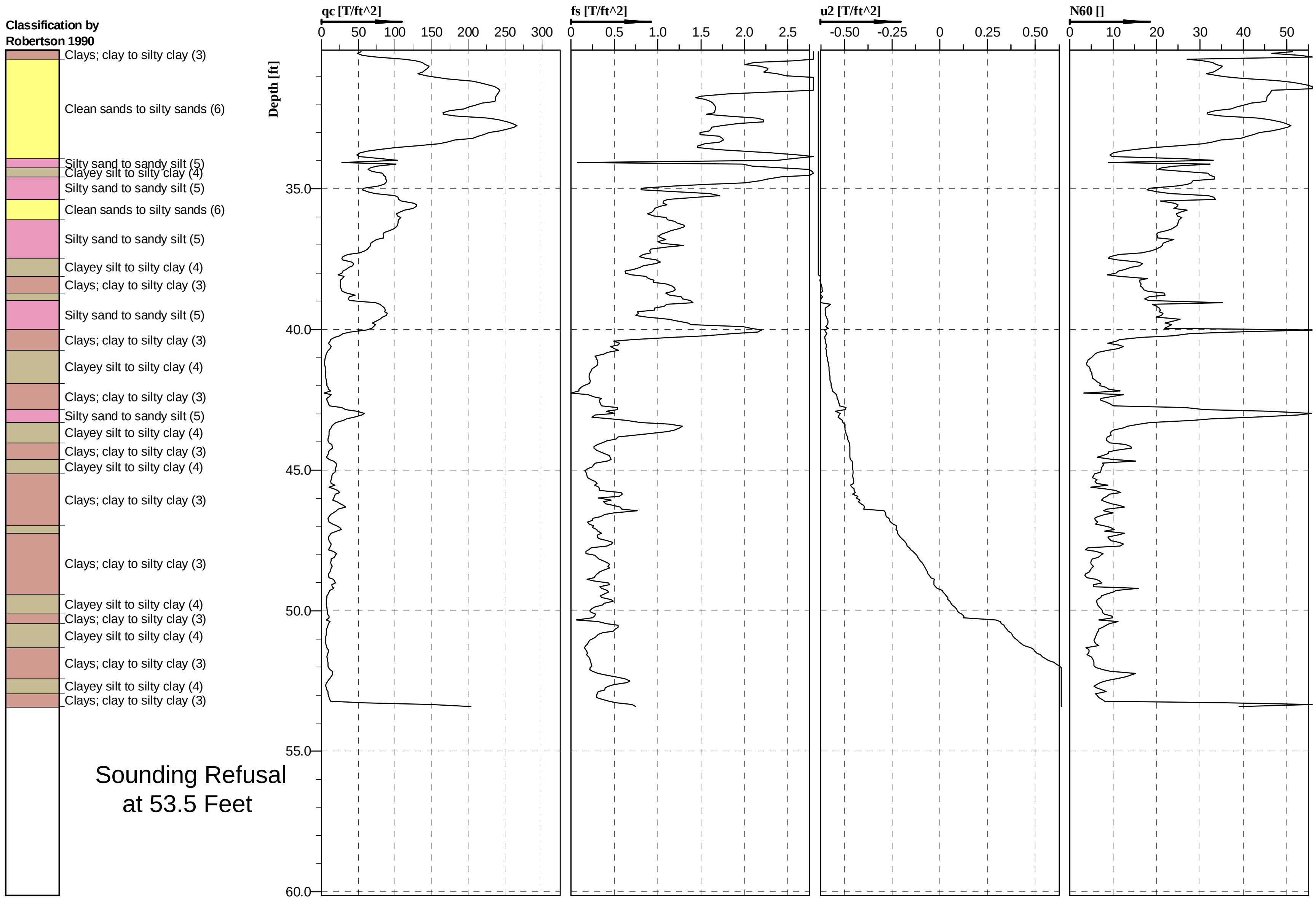
Location:	Project ID:	Ground Elev.:	Test No.:
Dublin, Georgia	10:5658		B-2
Project:	Client:	Date:	Page.:
VA Hospice Care Unit	J M Smith Engineering, LLC	12/28/09	1/1



U2

Cone No: 3814 NO ME
Tip area [cm2]: 10
Sleeve area [cm2]: 150

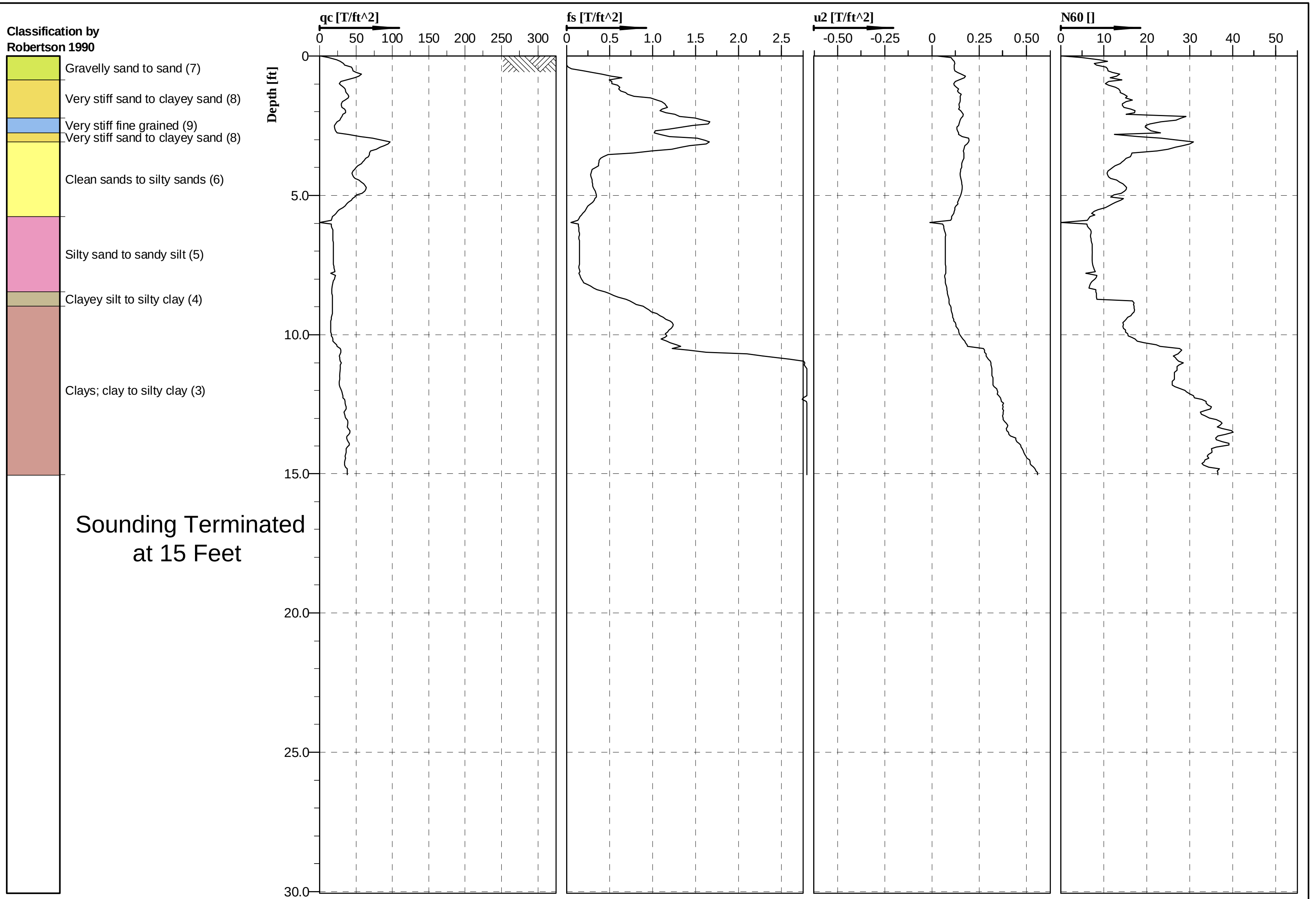
Location:	Project ID:	Ground Elev.:	Test No.:
Dublin, Georgia	10:5658		B-3
Project:	**Client:**	**Date:**	**Page.:**
VA Hospice Care Unit	J M Smith Engineering, LLC	12/28/09	1/2



U2

Cone No: 3814 NO ME
Tip area [cm2]: 10
Sleeve area [cm2]: 150

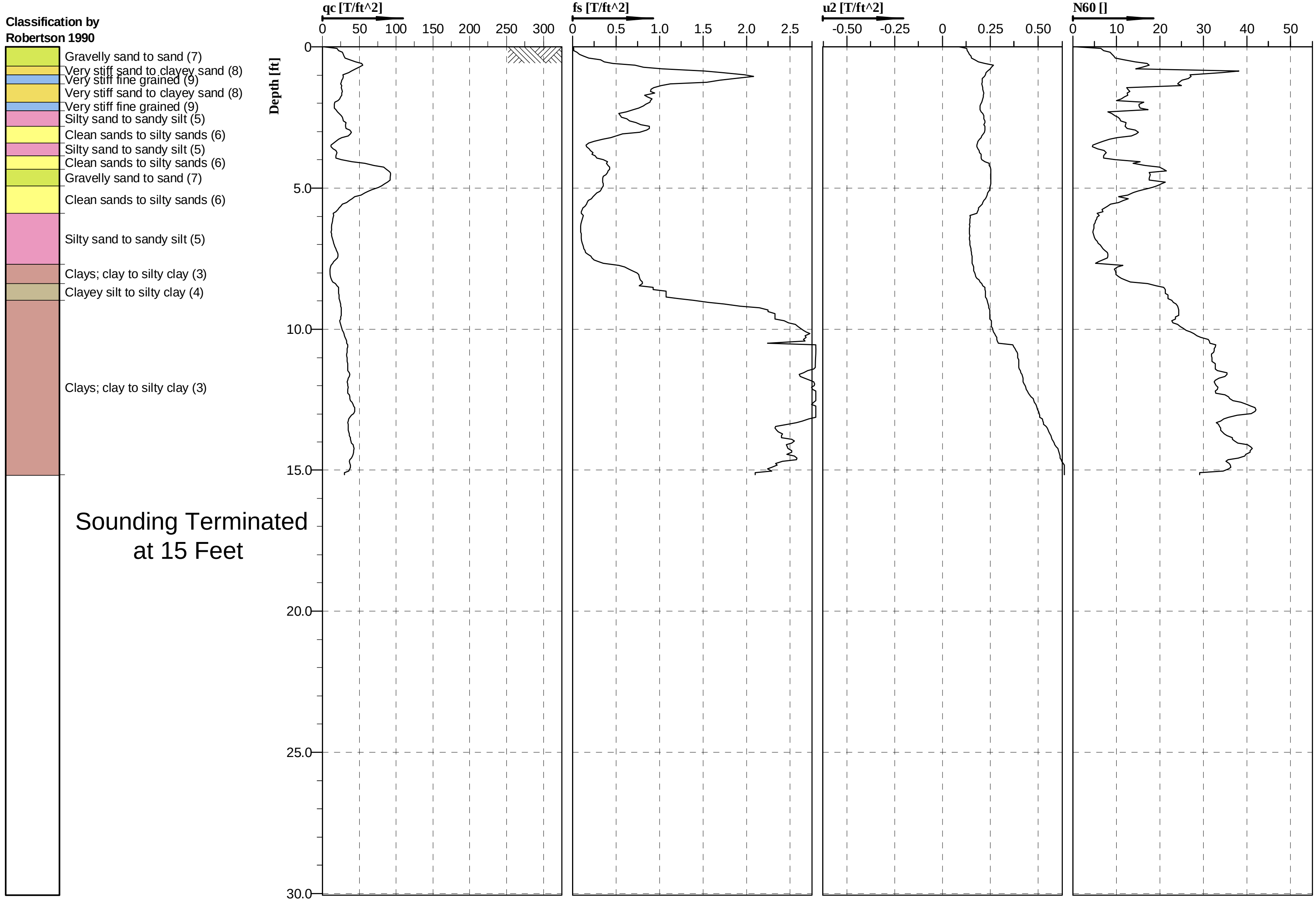
Location: Dublin, Georgia	Project ID: 10:5658	Ground Elev.:	Test No.: B-3
Project: VA Hospice Care Unit	Client: J M Smith Engineering, LLC	Date: 12/28/09	Page.: 2/2



U2

Cone No: 3814 NO ME
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Dublin, Georgia	Project ID: 10:5658	Ground Elev.:	Test No.: B-4
Project: VA Hospice Care Unit	Client: J M Smith Engineering, LLC	Date: 12/28/09	Page.: 1/1



U2

Cone No: 3814 NO ME
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: Dublin, Georgia	Project ID: 10:5658	Ground Elev.:	Test No.: B-5
Project: VA Hospice Care Unit	Client: J M Smith Engineering, LLC	Date: 12/28/09	Page.: 1/1

Hand Auger/Geoprobe Logs

SB-1		
Depth (feet)	**Soil Description**	**Classification (USCS)**
0-0.2	Topsoil	
0.2-5	Reddish Brown Clayey Sand	SC
Groundwater Observed Not Observed		

SB-2		
Depth (feet)	**Soil Description**	**Classification (USCS)**
0-0.1	Topsoil	
0.1-5	Reddish Brown Clayey Sand	SC
Groundwater Observed Not Observed		

SB-3		
Depth (feet)	**Soil Description**	**Classification (USCS)**
0-0.2	Topsoil	
0.2-15	Reddish Brown to Brown Clayey Sand	SC
Groundwater Observed Not Observed		

SB-4		
Depth (feet)	**Soil Description**	**Classification (USCS)**
0-0.2	Topsoil	
0.2-5	Reddish Brown Clayey Sand	SC
Groundwater Observed Not Observed		

SB-5		
Depth (feet)	**Soil Description**	**Classification (USCS)**
0-0.1	Topsoil	
0.1-5	Reddish Brown Clayey Sand	SC
Groundwater Observed Not Observed		

Appendix III

ECS SOUTHEAST, LLC

Atlanta, Georgia

Laboratory Testing Summary

Date: 1/6/2010

Project Number: 10:5658 **Project Name:** VA Hospice Care Unit

Project Engineer: KJH **Principal Engineer:** JCH **Summary By:** JWS

Boring Number	Sample Number	Depth (feet)	Moisture Content (%)	USCS	Liquid Limit	Plastic Limit	Plasticity Index	Percent Passing No. 200 Sieve	Compaction		CBR Value	Other
									Maximum Density (pcf)	Optimum Moisture (%)		
B-3	3	2-3	15.5	SC	39	17	22	49.9				

Summary Key:

SA = See Attached
S = Standard Proctor
M= Modified Proctor
V = Virginia Test Method
OC = Organic Content

Hyd = Hydrometer
Con = Consolidation
DS = Direct Shear
GS = Specific Gravity

UCS = Unconfined Compression Soil
UCR = Unconfined Compression Rock
LS = Lime Stabilization
CS = Cement Stabilization

NP = Non Plastic

Appendix IV

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all Do not rely on an executive summary Do not read selected elements only

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable A minor amount of additional testing or analysis could prevent major problems

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications Contractors can also misinterpret a geotechnical engineering report Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable *Be sure contractors have sufficient time* to perform additional study Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks *Read these provisions closely.* Ask questions Your geotechnical engineer should respond fully and frankly

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e g , about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance *Do not rely on an environmental report prepared for someone else*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project Confer with you ASFE-member geotechnical engineer for more information

ASFE
The Best People on Earth

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